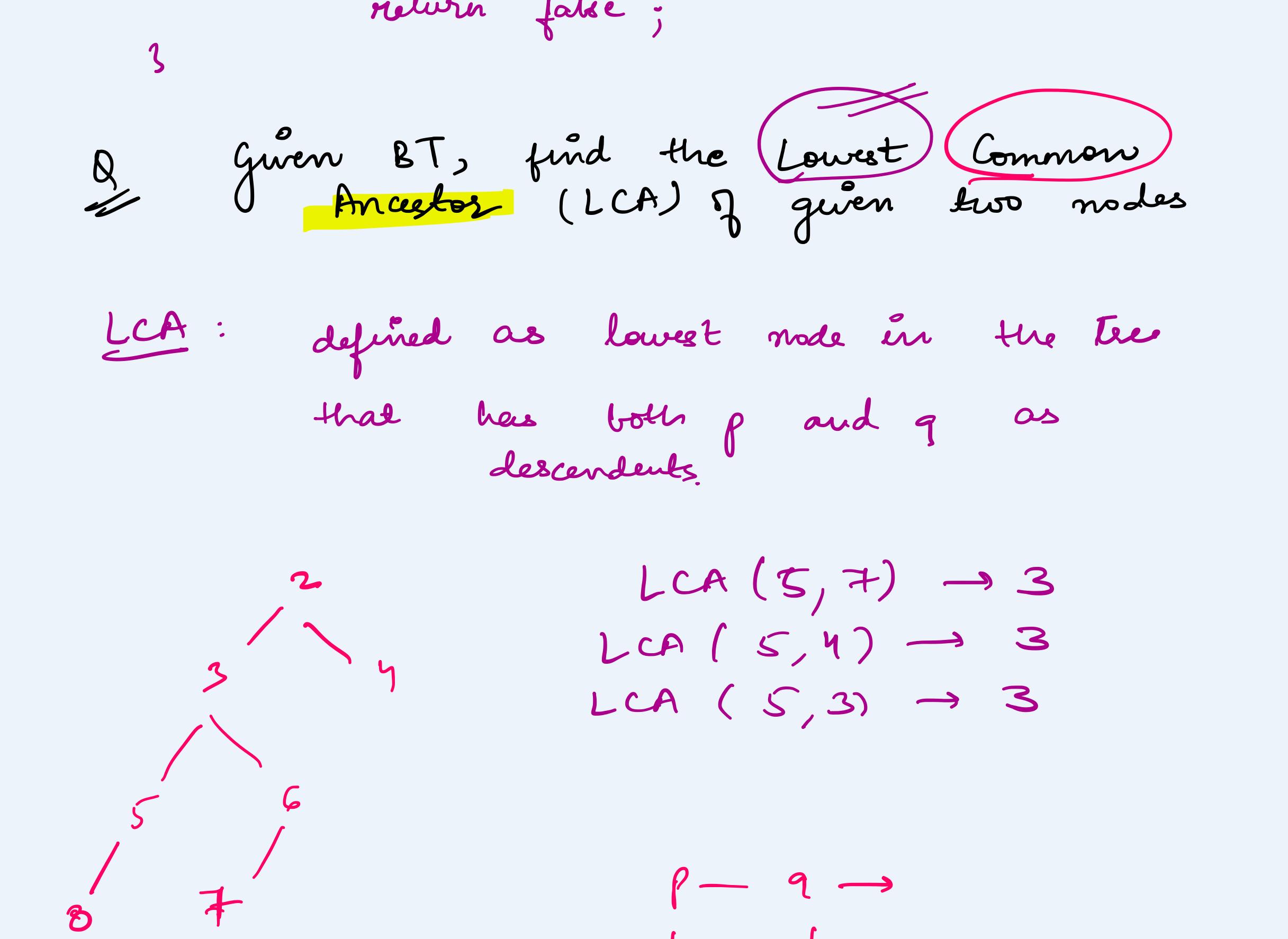


Q Given a BT, find the path from to a given node.



Q Given BT, find the Ancestors (LCA) of given two nodes.

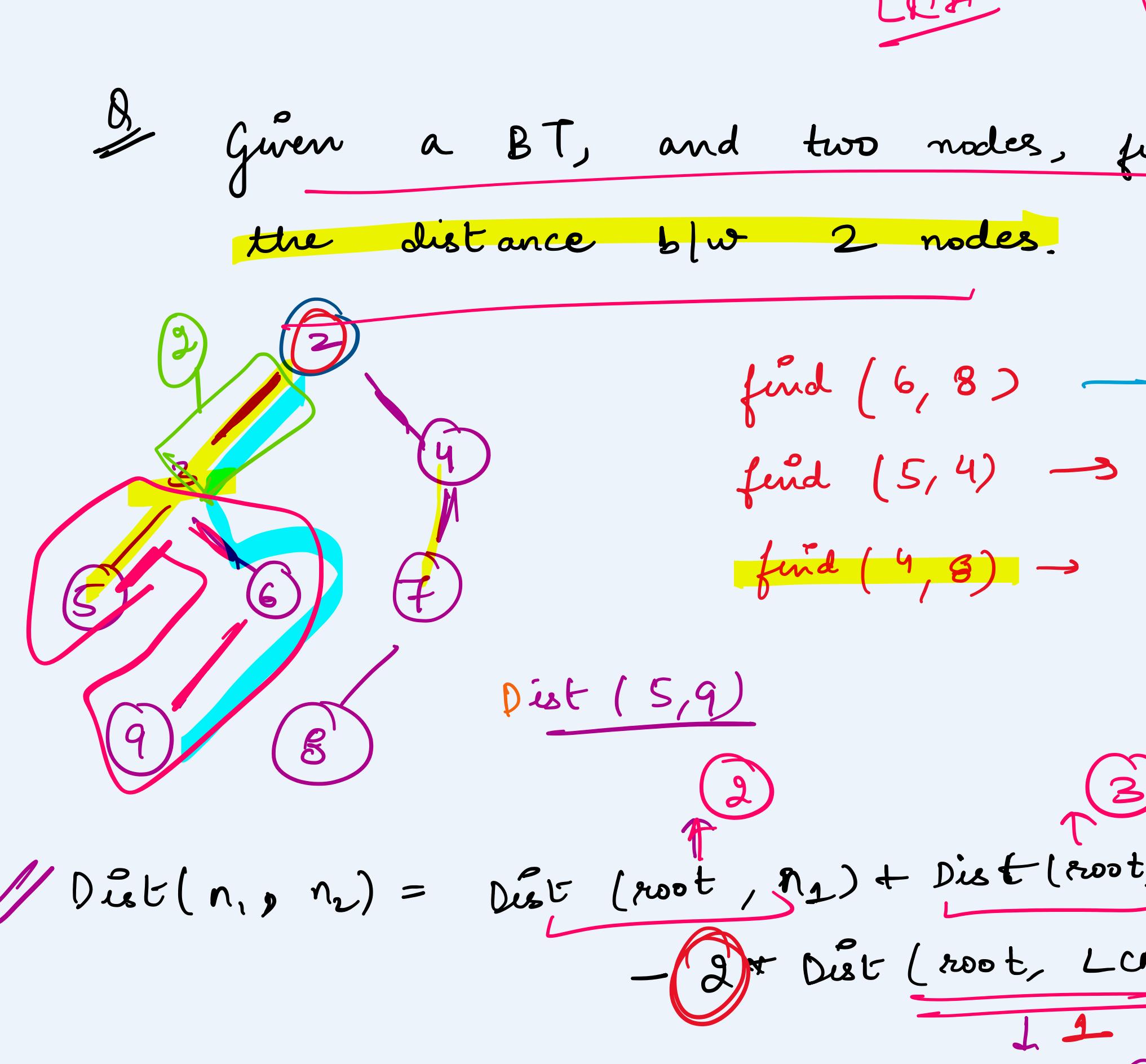
```
hasPath (root, ArrayList arr, x) {
    if (root == null)
        return false;
    arr.add (root.data);
    if (root.data == x)
        return true;
    if (hasPath (root.left, arr, x) || hasPath (root.right, arr, x))
        return true;
    arr.remove (arr.size () - 1);
    return false;
}
```



LCA: defined as lowest node in the tree that has both p and q as descendants.

$$\text{LCA}(5, 7) \rightarrow 3 \\ \text{LCA}(5, 4) \rightarrow 3 \\ \text{LCA}(5, 3) \rightarrow 3$$

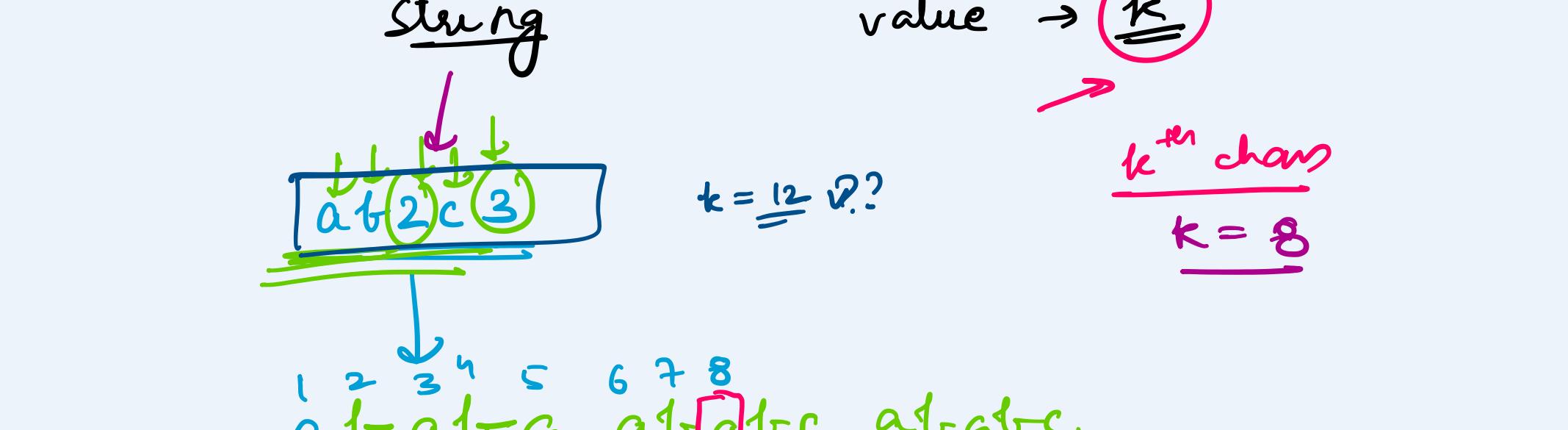
$$P - Q \rightarrow \boxed{\frac{1}{8}}$$



TC $\rightarrow O(n)$
SC $\rightarrow O(n)$

LCA (root — node)

Q Given a BT, and two nodes, find the distance b/w 2 nodes.



$$\text{Dist}(n_1, n_2) = \text{Dist}(\text{root}, n_1) + \text{Dist}(\text{root}, n_2) - 2 * \text{Dist}(\text{root}, \text{LCA})$$

$$\rightarrow (1 + 2 - 2 \cdot 0) = 3$$

Dist(n_1, n_2) \rightarrow Distance(n_1, LCA) + Distance(n_2, LCA) + root to node

$$1 + 2 = 3$$

Decrypt an encrypted string

String \rightarrow abcabcabc
 $k = 12$?

$k = 12$?

$k = 8$

ababc ababc ababc

ans \rightarrow a

ab235 cd27

ab235 cd27